CLAIMS

What is claimed is:

1. A semiconductor device including a plurality of transistors with their substrate of silicon, characterized in that

at least part of a silicon oxide film formed on a surface of said silicon contains Kr.

2. The semiconductor device according to claim 1, characterized in that

a recessed groove is formed at part of said substrate surface between said plurality of transistors, and a dielectric substance is formed in part of said groove,

said silicon oxide film is formed on a corner of said substrate surface in said groove, and at least part of said silicon oxide film contains Kr.

3. The semiconductor device according to claim 1, characterized in that a side wall portion in said groove is formed such that the angle of part of said side wall portion with said substrate surface exceeds at least 75 degrees.

4. The semiconductor device according to claim 1, characterized in that the difference in thickness of said silicon oxide film between the portions formed on at least part of the surface other than said groove of said substrate and on at least part of the surface in said groove is within 30%.

5. A semiconductor device wherein a

semiconductor film at part of a surface of which a recessed groove is formed or an island-shape semiconductor film is formed on an insulating film, characterized in that

a silicon oxide film is formed on a corner of said semiconductor film of said groove or a corner of said semiconductor film, and at least part of said silicon oxide film contains Kr.

6. The semiconductor device according to claim 5, characterized in that the content of Kr contained in said silicon oxide film decreases from said silicon oxide film surface toward a silicon/silicon oxide film interface.

7. The semiconductor device according to claim 5, characterized in that the Kr content in said silicon oxide film is 5×10^{11} cm^{-2} or less at the surface density.

8. A method for forming a silicon oxide film, characterized by introducing a mixture gas mainly containing a gas containing oxygen and Kr gas into a process chamber, exciting plasma with a microwave, and directly oxidizing a silicon substrate surface placed in the process chamber, thereby forming a silicon oxide film on said silicon substrate surface.

9. The method for forming a silicon oxide film according to claim 8, characterized in that said silicon oxide film is the gate insulating film of a transistor.

10. The method for forming a silicon oxide film

according to claim 8, characterized in that the oxygen partial pressure in said mixture gas is 2 to 4%, and the pressure in said process chamber is 800 mTorr (106 Pa) to 1.2 Torr (160 Pa).

11. The method for forming a silicon oxide film according to claim 8, characterized in that said plasma is plasma excited with a microwave of a frequency of 900 MHz to 10 GHz.

12. An apparatus for forming a silicon oxide film, characterized by comprising

a process chamber in which a silicon substrate is placed, and

a waveguide tube for supplying a microwave in said process chamber, and in that

a mixture gas mainly containing a gas containing oxygen and Kr gas is introduced into said process chamber, plasma is excited with the microwave, and said silicon substrate surface is directly oxidized, thereby forming a silicon oxide film on said silicon substrate surface.

13. A semiconductor device including a plurality of transistors each having its source and drain regions each comprising a high impurity concentration region, characterized in that

at least part of the portion between said source and drain regions is a silicon oxide film containing Kr.